14. (Amended) The fluidized bed reactor of claim 1 wherein the plurality of peripheral gas inlet jets includes a plurality of gas jets at each of said elevations respectively positioned around the circumference of the reactor housing.

15. (Amended) The fluidized bed reactor of claim 14 wherein the plurality of peripheral gas inlet jets at each elevation are equidistantly positioned around the circumference of the reactor housing.

A7

16. (Amended) The fluidized bed reactor of claim 14 wherein the plurality of peripheral gas inlet jets at each elevation are not aligned with the jets at the other elevations.

18. (Amended) The fluidized bed reactor of claim 1 wherein the plurality of peripheral gas inlet jets are positioned at at least three elevations.

19. (Amended) The fluidized bed reactor of claim 1 wherein the plurality of peripheral gas inlet jets are structurally formed so that the pressure drop across the plurality of peripheral gas inlet jets is at least 30% of the pressure drop across the reaction zone.

A8

20. (Amended) The fluidized bed reactor of claim 7 wherein the sparger is structurally formed so that the pressure drop across the sparger is at least thirty percent of the pressure drop across the reaction zone.

REMARKS

The Examiner's objections to the drawings, specification and claims in paragraphs 1-6 of the Office Action and the Examiner's objections under 35 USC § 112 in paragraph 7 of the Office Action should be cured by the foregoing amendments, except for the objection raised in paragraph 7 under 35 USC § 112 with regard to Claim 11 at the top of Page 5 of the Office Action. With regard to this latter objection, the Examiner asserted that "it is unclear as to the structural relationship of 'a solid or perforated diffuser section' to the other elements of the apparatus". The subject matter of Claim 11 has been incorporated into Claim 1 and should make it clear that there is no solid or perforated diffuser section between the central gas and/or solids inlet and the reaction zone. A solid or perforated diffuser is an element commonly found in fluidized bed reactors as demonstrated in the cited references.

Claim Rejections – 35 USC § 102

In paragraph 8 of the Office Action, Claims 1-4, 6-10, 12, 14-15 and 19-20 are rejected under 35 USC § 102(b) as being anticipated by Sowards (US Patent 4,075,953). Sowards teaches a fluidized bed incinerator in which heated air is forced under pressure up through a diffusion bed of olivine sand into a reaction zone where it incinerates waste which

is fed from the top of the reactor and dispersed throughout the reaction zone. A diffusion grid plate 45 supports the reactor bed and has apertures 41 and 43. The apertures 43 disperse the forced air through nozzles 67 to entrain the waste in the reaction zone above the bed. Apertures 41 in the grid plate 45 function to purge some of the waste, lodged in the bed, back into the reaction zone. A separate air supply, through nozzle 105, forces air inserted at the top of the reactor down towards the bed where it turns under the force of the heated air from nozzles 67, towards the top of the reactor along the peripheral walls of the reactor housing. Nozzles 115 impart a vortex motion to the rising air and help force some of the heavier particles back towards the bed for more complete incineration. The embodiment shown in Figures 10-13 is a variation on the design of Figure 1, that continually filters and recycles the bed material and separates out the reaction waste settled in the tramp zone. Neither embodiment of Sowards has a central gas and/or solids inlet proximate the bottom of the reaction zone within the reactor housing for directing gas and/or solids in an upward direction along the housing to maintain the raw materials in suspension; nor does Sowards introduce gas into the reaction zone from the lower portion of the reactor without passing through a solid or perforated diffuser section. The grid plate 45 and the bed 30 taught in Sowards are definitely intended to be a diffuser section. Additionally, with respect to Claim 2, which calls for a reactor housing having a conical section circumscribing the reaction zone with the reduced diameter of the conical section at its lower end interfacing with the central gas and/or solids inlet, Sowards reaction zone is not circumscribed by conical section, though the bed is shown as having a reduced diameter.

Claim 3 further distinguishes over Sowards by calling for a residue collection housing mating at one end with the conical section of the reactor housing, since the residue collection housing 172 of Figure 10 of Sowards is the conical section and does not mate with a conical section. Claim 8 further distinguishes over the teachings of Sowards because the closest thing to a sparger in Sowards are the orifices 41, which clearly do not introduce the gas at a downwardly-directed angle. Claim 12 further distinguishes over the teachings of Sowards in that Sowards clearly does not provide any teaching to having thirty percent of the gas introduced by a central gas inlet, approximately sixty five percent through the peripheral gas jets and five percent through the sparger. In addition, Claim 19 further distinguishes over the teachings of Sowards for the individual limitations it introduces because Sowards does not teach that the peripheral gas inlet jets provide thirty percent of the pressure drop across the

reaction zone. In fact, Sowards teaches away from this very limitation. Similarly, Claim 20 further distinguishes over the teachings of Sowards because nowhere in Sowards is there a teaching that the pressure drop across the sparger should be at least thirty percent of the pressure drop across the reaction zone.

In *in re: Marshall* 578 F.2d 301, 198 USPQ 344 (CAFC, June 30, 1978), the court stated that "to constitute an anticipation, all material elements recited in a claim must be found in one unit of prior art…an accidental or unwitting duplication of an invention cannot constitute an anticipation." In this instance, as pointed out above, many of the elements of applicants' claims are neither described, taught or shown or even suggested by the reference. Accordingly, it is respectfully asserted that the rejection under 35 USC § 102, based upon Sowards, is improper and should be withdrawn.

In paragraph 9 of the Office Action, Claim 1-2, 14-15 and 18-19 are rejected under 35 USC § 102(b) as being anticipated by Golant et al. (US Patent 4,532,155). Golant et al. teaches a fluidized bed apparatus and method for coating, granulating and/or drying particles. The particles are circulated within a chamber by means of circumferential air flow. A first gas stream moves upwardly through the chamber. A second gas stream enters the chamber through openings in the sidewall of the chamber. The openings extend generally horizontally and tangential to the sidewall so that the second gas is directed circumferentially in the chamber for three dimensional rotation and circulation of the particles. The first gas moves upwardly through a conical plenum through a fine mesh screen 19 having perforations 20. The mesh screen 19 forms a separation between the first gas plenum and the reaction zone and functions to diffuse the first gas stream before it enters the reaction zone. Accordingly, the reference neither describes, teaches or shows the combination of elements of applicants' Claim 1 as now amended, which specifies that there is no solid or perforated diffuser section interposed between the central gas and/or solids inlet and the reaction zone. Furthermore, the central gas inlet of the reference is not proximate the bottom of the reaction zone as called for by applicants. Accordingly, the reference fails to teach several aspects of applicants' independent Claim 1 and does not meet the requirement that "all material elements recited in a claim must be found in one unit of prior art" to constitute an anticipation as quoted above from *in re: Marshall.* (ibid) In addition, Claim 19 further distinguishes over the reference in that the reference does not describe, teach or show that the pressure drop across the plurality of peripheral gas inlet jets is at least thirty percent of the pressure drop across the reaction

zone. In that regard, the Examiner has taken the position that the pressure drop is not an element of the apparatus. However, setting the specification the pressure drop dictates a design element of the peripheral gas inlet jets relative to the central gas and/or solids inlet and the sparger. Accordingly it is respectfully asserted, in light of the foregoing, that the rejection under 35 USC § 102(b), as being anticipated by Golant et al., is no longer appropriate and should be withdrawn.

In paragraph 10 of the Office Action, Claims 1-2, 14-16 and 19 are rejected as being anticipated by Heath et al. (US Patent 3,661,558). Heath et al. teaches a fluidized bed reactor 10 made up of a cylindrical shell 12. The top of the reactor is provided with an exit conduit 20 for disposing of the spent fluidizing gases. The bottom of the reactor is provided with a wind box or cone section 22 having a valve cleanout conduit 23. Located in the bottom of the reactor cylindrical section 12 and extending throughout its cross-sectional area is a solid supporting constriction plate 24, which is provided with gas-admitting apertures 26. Fluidizing gas is blown into the wind box 22 while the solids to be treated are fed into the cylindrical section through a plurality of feed guns 32 located around the periphery of the reactor to form a bed 34 of solids. In operation, the bed 34 is fluidized by the gases entering the wind box 22 and passing through the apertures 26 in the constriction plate 24. The invention lies in the design of a distribution tank located on top of the reactor for supplying the feed guns 32. With regard to Claim 1, the Heath et al. reference neither describes, teaches or shows a central gas and/or solids inlet proximate the bottom of the reaction zone. Reference character 30 is a gas feed to the gas plenum 22 through which the gas is distributed through the baffle diffusion plate 24 to the reactor bed 34. Furthermore, as now required by applicants' amended Claim 1, there is no requirement taught in the reference that the central gas and/or solids inlet be structured to introduce the gas into the reaction zone without passing through a solid or perforated diffusion section, which is the diffusion section 24 of the reference. Additionally, the peripheral gas inlet jets that the Examiner refers to in the reference are aspirators that use injected air to spray the slurry over a wide area of the fluid bed 34, but can hardly be said to promote mixing of the raw materials in suspension. Furthermore, the aspirators are not positioned at at least two elevations along the elongated dimension of the housing. For the foregoing reasons, Heath et al. fails to teach, describe or disclose several elements of applicants' Claim 1 as now amended. Accordingly, it is respectfully asserted that the rejection under 35 USC § 102(b) as being anticipated by Heath

et al. is now improper and should be withdrawn.

Furthermore, Claim 2 further distinguishes over the reference in that it calls for a conical section circumscribing the reaction zone with the reduced diameter of the conical section at the lower end interfacing with the central gas and/or solids inlet. Heath et al. has a conical section well below the reaction zone and interfaces with a gas inlet to the diffusion plate in the upper portion of the conical section, well above the reduced diameter portion of the conical section at its lower end. Therefore, for these several additional reasons, Claim 2 distinguishes over the Heath et al. reference.

Claim 16 further defines that the plurality of peripheral gas inlet jets at each elevation are not aligned with the jets at the other elevations. This limitation is neither described, taught or shown in the Heath et al. reference and therefore, Claim 16 further distinguishes over the reference for the individual limitation that it introduces. Similarly, Claim 19 specifies that the pressure drop across the plurality of peripheral gas inlet jets is at least thirty percent of the pressure drop across the reaction zone; a specification that is neither described, taught or shown in the Heath et al. reference. As applicants previously explained, the specification of the pressure drop is a structural limitation on the relative makeup of the various gas flow paths.

For the foregoing reasons, it is respectfully asserted that the rejection of Claims 1-2, 14-16 and 19 under 35 USC § 102(b), as those claims are now amended, as being anticipated by Heath et al., is improper. Accordingly, withdrawal of the rejection is respectfully requested.

In paragraph 11 of the Office Action, Claim 5 was rejected under 35 USC § 103 as being unpatentable over Sowards in view of Grill et al. (U.S. Patent 3,989,446). The teachings of Sowards has been described above. Grill et al. teaches a kiln in which an aqueous solution of magnesium chloride is sprayed and where it is countercurrently heat-treated by a stream of hot gas produced by flames projected into the chamber by burners. Calcined material is removed from the bottom of the kiln chamber and the hot gas stream and any treated material carried thereby is removed from the top of the chamber. Material carried by the hot gas stream is separated therefrom in a cyclone separator and the separated material is returned to the kiln chamber through a zone heated to a temperature in the range of the temperature in the kiln chamber. The calcined material that drops to the bottom of the chamber is removed through an outlet by a screw conveyor.

In contrast, Claim 5 teaches a fluidized bed reactor having a vertically oriented reactor housing for confining a reaction of raw materials as they are transformed; a portion of the reactor housing confining the reaction of the raw materials defining a reaction zone. A central gas and/or solids inlet is positioned proximate the bottom of the reaction zone within the housing for directing gas and/or solids in an upward direction along the vertical axis of the housing to maintain the raw materials in suspension. The central gas and/or solids inlet is positioned so the gas is introduced into the reaction zone without passing through a solid or perforated diffuser section. The reactor housing is formed with a conical section circumscribing the reaction zone, with the reduced diameter of the conical section at its lower end interfacing with the central gas and/or solids inlet. A residue collection housing mates at one end with the conical section and has an inclined lower wall for directing residue from the conical section to a residue collection port through which the residue can be extracted from the fluidized bed reactor. A screw or rotary feeder is positioned at the residue collection port for removing the residue from the collection housing.

Neither Sowards or Grill et al. teach a central gas or solids inlet proximate the bottom of the reaction zone, nor do they teach a reactor housing having a conical section circumscribing the reaction zone with the reduced diameter of the conical section at its lower end interfacing with the central gas and/or solids inlet. For these several reasons, it is respectfully asserted that Claim 5 patentably distinguishes over the references. As the Court of Appeals for the Federal Circuit stated in *in re: Fitch* 972 F.2d 1260, 23 USPQ 2d 1780 (August 11, 1992), "Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination...The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification." The court further went onto state that "Here the Examiner relied upon hindsight to arrive at the determination of obviousness. It is impermissible to use the claimed invention as an instruction manual or 'template' to piece together the teachings of the prior art so that the claimed invention is rendered obvious. This court has stated that '(O)ne cannot use hindsight reconstruction to pick and choose among the isolated disclosures in the prior art to deprecate the claimed invention." It is respectfully asserted that there is no teaching in either reference that would suggest substituting the screw feeder 7 of Grill et al., which has no separation or recycling function, for the combination sifter and double conveyer

of Sowards. For this further reason, it is respectfully asserted that Clam 5 distinguishes over the references and should not be considered obvious.

In paragraph 12 of the Office Action, Claim 11 is rejected under 35 USC § 103(a) as being unpatentable over Sowards in view of Newby (US Patent 4,776,388). Newby describes a method and apparatus for cooling of hot waste gases using a jetting bed fluidized bed technique. A nozzle or plurality of nozzles inject the hot waste gases upwardly into a bed of solid particulate material contained in a housing, with the jet of hot gases fluidizing the bed and being dissipated therein, without substantially disturbing the surface of the bed of solids. A plurality of nozzles is spaced such that the jets of hot waste gas do not impinge upon one another. With use of a vertically-extending housing, a single jet of hot waste gases may be used.

Claim 11 has now been incorporated into Claim 1 and adds the limitation that the central gas inlet is arranged to introduce gas into the reaction zone without passing through a solid or perforated diffuser section. In Newby, a horizontally-extending bed of solid particulate matter requires a plurality of spaced nozzles fed from a gas manifold to diffuse the gas through the solid particulate material. Where a vertically-extending bed of particulate matter is used, a single jet can be employed because the particulate solids have the opportunity to diffuse the jet before the gas leaves the bed of particulate matter. In each case, the gas leaves the gas inlet and enters into a diffuser section. The solid particulate matter is not maintained in suspension as asserted by the Examiner, since the reference clearly states that the jet of hot gases fluidizes the bed and is dissipated therein without substantially disturbing the surface of the bed of solids. Therefore, it is respectfully asserted that Claim 1, which now incorporates the subject matter of Claim 11, patentably distinguishes over Sowards in view of Newby. Furthermore, Newby fails to supply the other deficiencies noted for Sowards. Accordingly, it is respectfully requested that the rejection under 35 USC § 103(a) over Sowards in view of Newby be withdrawn.

Claim 13 is rejected under 35 USC § 103(a) as being unpatentable over Sowards in view of Annen et al. (US Patent 5,423,133). Sowards was applied as mentioned above. Annen et al. was cited to show a plurality of gas valves at different elevations of a drying hopper for regulating the flow rate of gas in a conical hopper to dry a polyethylene powder. The various nozzles, in combination with a flow control valve, is adapted to regulate the flow rate of heated nitrogen gas used to dry the powder so as to render uniform the pressure of the

heated nitrogen gas injected through each nozzle. Sowards, at column 3 starting at line 39 states that, depending upon the particular material and circumstances, pieces of solid waste which are fed into the reactor may be predried before being fed into the incinerator, or water may be added thereto prior to or simultaneously with displacement into the incinerator. On the other hand, Annen et al. teaches a drying hopper for drying polyurethane powder. It is respectfully asserted, as stated in *in re: Hitch*, ibid, "Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination". Nowhere does either reference suggest the desirability of the combination. It is respectfully asserted that here the Examiner is relying on hindsight to arrive at a determination of obviousness, which is clearly impermissible as stated in *in re: Fitch*. Accordingly, it is respectfully believed that the rejection in paragraph 13 of the Office Action under 35 USC § 103(a) over Sowards in view of Annen et al. is improper and should be withdrawn.

In paragraph 14 of the Office Action, Claim 16 is rejected under 35 USC § 103(a) as being unpatentable over Sowards (US Patent 4,075,953) in view of Heath et al. (US Patent 3,661,558). Claim 16 calls for the fluidized bed reactor of Claim 14 wherein the plurality of peripheral gas inlet jets at each elevation are not aligned with the jets at the other elevations. The Examiner asserted that Sowards is silent as to the placement of the peripheral gas jets and concluded that it would be obvious to align the peripheral gas jets such as evidenced by Heath et al. As previously mentioned, the Examiner is equating the feed guns 32 with aspirator inputs 33 to applicants' peripheral gas jets. The aspirators 33 inject air as the driving force for feeding the slurry into the bed of the reactor. It is believed a stretch to equate the feed nozzles 32 with the peripheral gas jets of applicants' invention. In column 4 of the Heath et al. reference, starting at line 4, the reference states:

> The slurry is blown into the reactor by the feed guns 32 operating with injection air supplied through an aspirator 33. The injection air serves to spray the slurry over a wide area of the fluid bed 34. Uniform distribution of the feed over the bed is further enhanced by placing the guns 32 around the periphery of the reactor in an arc about 220° and at different elevations in order to vary the depth of the spray into the reactor. The remaining 140° arc of the reactor is reserved for the calcine discharge conduit or conduits 36.

The only other mention in Heath et al. of the placement of the feed guns 32 is in column 2, starting at line 52, where it stated that the bed solids are fed through a plurality of feed guns located around the periphery of the reactor. There is no mention of the alignment or misalignment of the feed guns at different elevations. Furthermore, Sowards teaches aligning the gas jets at the various elevations in the embodiments shown in Figures 1 and 10. Accordingly, it is respectfully asserted that Heath et al. adds no relevant teachings to that of Sowards and Sowards teaches away from applicants' invention by showing the vertical alignment of the peripheral jets at the different elevations. As stated in *in re: Fitch*, 972 F.2d 1260, 23 USPQ 2d 1780 (CAFC, 8/11/92), "The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification". Nowhere in either Sowards or Heath et al. is such a suggestion made. In fact, there is no mention of misaligning the nozzles at the different elevations in either of the references. Accordingly, it is respectfully asserted that the rejection of Claim 16 in paragraph 14 of the Office Action is improper and should be withdrawn.

In paragraph 15 of the Office Action, Claim 17 stands rejected under 35 USC § 103(a) as being unpatentable over Sowards. Claim 17 calls for the fluidized bed reactor of Claim 4, wherein the feeder removes the residue from the reactor in batches during reactor operation. The Examiner admits that Sowards is silent about removing the residue from the reactor in batches during operation, but felt it was obvious, to convert a process from continuous to batch. However, it is not so obvious in the embodiment of Sowards, which requires removal of the bed material with the residue and separation of the residue from the bed. To accomplish that during operation would require a continuous feedback of the bed material or it would run dry. Accordingly, it is respectfully asserted that applicants' Claim 17 is not obvious over Sowards.

In paragraph 16 of the Office Action, the Examiner rejected Claim 18 as obvious under 35 USC § 103(a) over Sowards in view of Golant et al. Claim 18 calls for the fluidized bed reactor of Claim 1, wherein the peripheral gas inlet jets are positioned at at least three elevations. The Examiner admits that Sowards is silent as to the placement of peripheral jets at least three elevations, but relies on Golant et al. for that teaching. Claim 18 is dependent on Claim 1, which was previously distinguished over Sowards and Golant et al. and therefore patentably distinguishes as well for the very same reasons.

Accordingly, applicants' Claims 1-20 patentably distinguish over the references. Therefore reconsideration, allowance and passage to issue of this application are respectfully requested.

Respectfully submitted,

Daniel C. Abeles
Registration No. 25,822
412.566.1292
Attorney for Applicants

APPENDIX

Additions are shown by underlining, deletions by strikethrough

In the specification:

Page 5, starting with first full paragraph through to Page 7, end of first paragraph:

Chlorine is introduced into the fluidized bed reactor of this invention in three different ways. First, approximately 30% of the chlorine is introduced through a primary inlet or central tube 22 which is centrally disposed along the axis of the reactor extending from below the discharge conduit to the lower portion of the reactor bed. Secondly, approximately 5% of the chlorine is introduced through a sparger 30 which encircles the greater portion of the circumference of an upper portion of the residue discharge conduit or collection or cylindrical discharge tube 18, below the housing 12. The sparger 30 introduces the chlorine at a horizontal or preferably downward angle, e.g., 45°, to the horizontal to prevent particle sifting into the sparger. The downwardly directed gas from the sparger turns in the discharge tube in an upwardly direction towards the bed. The pressure drop through the sparger has to be at least thirty percent of the pressure drop through the whole bed; that is the differential pressures measured between the bottom and top of the bed. The flow rate through the sparger is designed to provide a conducive fluidizing condition to allow segregation and passage of larger agglomerates while forcing the bed particles and finer agglomerates back into the reaction region to minimize the overall residue. The presence of the sparger 30 creates a separate fluidized bed in the discharge tube 18. Operation of the discharge tube 18 at a fluidizing velocity 1.2 to 1.5 times the minimum fluidization velocity of the larger agglomerates to be separated will allow segregation and passage of the larger agglomerates for withdrawal. This is a well-known principle in fluidized bed operation.

The lower portion of the housing 12 forms a plenum 28 which connects through an orifice plate 29 to gas conduits 26 which communicate with the gas orifices 24 within a distribution or conical diffuser plate 16 at at least two spaced elevations and preferably three spaced elevations "a", "b" and "c" as shown in this embodiment. Though only shown on one side, for purposes of illustration, the orifices at each of the three elevations are spaced circumferentially around the distribution plate 16 and preferably the jets at each of the elevations are not aligned. Approximately 65% of the chlorine is distributed through the orifices 24. In this embodiment there are four orifices positioned equidistantly around the lower elevation "a" of the distribution plate and eight orifices equidistantly distributed around the distribution plate at each of the other two elevations. Preferably, the orifice 24 directs the chlorine gas at a slight

angle downward to the horizontal, e.g., 10°, to prevent sifting of the powder into the orifices. The orifices are sized and the gas flow from the orifices are designed to allow the orifice jets to penetrate to the middle of the reactor ~~12~~10. The pressure drop through the orifices are at least 30% of that across the entire bed. Those orifice jets entrain powder and gas continuously and eventually degenerate into bubbles and promote intensive gas and solids mixing and contacting. This design is particularly effective for cohesive powders which cannot be fluidized conventionally. Individual control of each of the orifices 24, as figuratively represented by the controller 27, to adjust flow, provides exceptional operational flexibility. Preferably, all the surfaces of the reactor that contact the gas are constructed from materials such as graphite as previously mentioned or stainless steel, that can withstand the corrosive characteristics of chlorine. Though the embodiment shown in Figure 1 identifies the number of orifices and the number of jet elevations, the design will be different depending on the size of the chlorinator. In all cases, however, the design will follow the fluidization and gas/solids contacting principles described in this disclosure and will include at least two elevations of jets directing a fluidizing gas directly into the bed.

A pilot reactor was designed for cold flow simulation of this invention. It was found that the large central jet or tube 22 enhances the solid circulation and mixing inside the bed, and promotes a solid flow pattern conducive to agglomeration of impurities. The intensive solids mixing produced by the central jet 22 and the peripheral orifices 24 provides a more uniform temperature in the bed and improves production. In this test, the upper diameter "d" of the bed was approximately 10 inches (25.4 centimeters) and narrowed at its conical lower portion "g" to 4 inches (10.2 centimeters). A 0.5 (1.27 centimeters) inch diameter graphite pipe was employed for the central jet 22 and the orifices in the distribution plate were located 2, 4 and 6 inches above the residue discharge conduit or collection tube 18 and were 0.0787 inches (2 millimeters) in diameter. The slope "f"of the distribution plate 16 was approximately 70° to the horizontal. These relative dimensions can be employed to scale the design from a pilot model to a production reactor size. Accordingly, this invention enables a continuous reaction to be sustained within the fluidized bed without clogging of the bed and enables either continuous or on-line batch removal of the process residue.

In the claims:

Please cancel Claim 11

1. (Amended) A fluidized bed reactor for mixing a plurality of raw materials and transforming a chemical property of the raw materials to establish a desired product comprising:

a hollow, elongated, vertically oriented reactor housing for confining ~~the~~ a reaction of the raw materials as they are transformed, a portion of the reactor housing confining the reaction of the raw materials defining a reaction zone;

a central gas and/or solids inlet proximate the bottom of ~~a~~ the reaction zone within the housing for directing gas and/or solids in an upward direction along ~~parallel to~~ the vertical axis of the housing ~~to~~ into the reaction zone without passing through a solid or perforated diffuser section to maintain the raw materials in suspension; and

a plurality of peripheral gas inlet jets positioned at at least two elevations along the elongated dimension of the housing for introducing gas at an angle to the elongated dimension of the housing to promote mixing of the ~~entrained~~ raw materials in suspension.

2. (Amended) The fluidized bed reactor of claim 1 wherein the reactor housing has a conical section circumscribing the ~~in its~~ reaction zone with the reduced diameter of the ~~cone~~ conical section at its lower end interfacing with the ~~central~~ gas and/or solids inlet.

3. (Amended) The fluidized bed reactor of claim 2 including a residue collection housing mating at one end with the ~~reduced diameter~~conical section of the reactor housing and having an inclined lower wall for directing a reaction process residue from the ~~reaction process~~conical section to a residue collection port through which the residue can be extracted from the fluidized bed reactor.

7. (Amended) The fluidized bed reactor of claim 3 including a sparger surrounding at least a portion of the residue collection housing for introducing gas within the residue collection housing to maintain reaction process residue below a given size in suspension and directed back into the ~~reaction zone~~conical section while enabling ~~residue~~ agglomerates of reaction process residue above the given size to drop towards the collection port.

9. (Amended) The fluidized bed reactor of claim ~~3~~ 7 wherein the incline of the lower wall of the residue collection housing is designed so that the gravitational forces on the residue above the given size will overcome the wall friction and travel to the collection port.

VERSION WITH MARKINGS TO SHOW CHANGES MADE

10. (Amended) The fluidized bed reactor of claim 1 wherein the plurality of peripheral gas inlet jets are directed at a downward angle to a line perpendicular to the central axis of the reactor housing.

12. (Amended) The fluidized bed reactor of claim 7 wherein the central gas inlet, the plurality of peripheral gas inlet jets and sparger are structurally formed so that approximately 30% of ~~the~~ a fluidizing gas is introduced through the central gas and/or solids inlet, approximately 65% of the fluidizing gas is introduced through the plurality of peripheral gas inlet~~s~~ jets, and 5% of ~~and~~ the fluidizing gas is introduced through the sparger.

13. (Amended) The fluidized bed reactor of claim 1 including control valves in fluid communication with a fluidizing gas supply and respective ones or groups of the plurality of peripheral gas inlet jets for individually controlling the quantity of gas passing through the respective plurality of peripheral gas inlet jets.

14. (Amended) The fluidized bed reactor of claim 1 wherein the plurality of peripheral gas inlet jets ~~inlets~~ includes a plurality of gas jets at each of said elevations respectively positioned around the circumference of the reactor housing.

15. (Amended) The fluidized bed reactor of claim 14 wherein the plurality of peripheral gas inlet jets at each elevation are equidistantly positioned around the circumference of the reactor housing.

16. (Amended) The fluidized bed reactor of claim 14 wherein the plurality of peripheral gas inlet jets at each elevation are not aligned with the jets at the other elevations.

18. (Amended) The fluidized bed reactor of claim 1 wherein the plurality of peripheral gas inlet jets are positioned at at least three elevations.

19. (Amended) The fluidized bed reactor of claim 1 wherein the plurality of ~~pressure drop across the~~ peripheral gas inlet jets ~~is at least thirty percent of~~ are structurally formed so that the pressure drop across the plurality of peripheral gas inlet jets is at least 30% of the pressure drop across the reaction zone.

20. (Amended) The fluidized bed reactor of claim 7 wherein the sparger is structurally formed so that the pressure drop across the sparger is at least thirty percent of the pressure drop across the reaction zone.